



THE EFFECT OF CONGKLAK MEDIA ON ELEMENTARY STUDENTS' MATHEMATICS LEARNING OUTCOMES AND SELF-CONFIDENCE

Henderina Lilihata*, La Suha Ishabu, Nussy Pattimukay

Department of Elementary School Teacher Education, Pattimura University, Ambon City, Indonesia

Corresponding author email: henderinalilihata@gmail.com

Abstract

Elementary students often struggle with abstract mathematical concepts such as Least Common Multiple (LCM) and Greatest Common Factor (GCF), which negatively impacts their learning outcomes and self-confidence. This study aimed to examine the effect of using congklak media on students' mathematics learning outcomes and self-confidence in Grade IV at SD Negeri 71 Ambon. A quasi-experimental nonequivalent control group design was employed, involving 34 students divided into experimental (n=17) and control (n=17) classes. Data were collected through validated pretest-posttest instruments and a self-confidence questionnaire, then analyzed using Independent Sample t-test and a Wilcoxon signed-rank test. Results indicated a significant improvement in learning outcomes for the experimental class (mean = 78.29) compared to the control class (mean = 57.06), with Sig. = 0.001. Additionally, students' self-confidence rose significantly from the low category (48.90%) to the high category (89.85%), confirmed by Sig. = 0.000. Classroom observations also revealed highly active student and teacher engagement. These findings demonstrate that congklak media is an effective, culturally relevant, and interactive learning tool that simultaneously enhances cognitive achievement and affective development in elementary mathematics education.

Keywords: Congklak Media; Elementary School; LCM And GCF; Learning Outcomes; Self-Confidence

Abstrak

Siswa sekolah dasar sering mengalami kesulitan dalam memahami konsep matematika abstrak seperti Kelipatan Persekutuan Terkecil (KPK) dan Faktor Persekutuan Terbesar (FPB), yang berdampak negatif pada hasil belajar dan kepercayaan diri mereka. Penelitian ini bertujuan untuk menguji pengaruh penggunaan media congklak terhadap hasil belajar matematika dan *self-confidence* siswa kelas IV di SD Negeri 71 Ambon. Desain kuasi eksperimen *nonequivalent control group* diterapkan dengan melibatkan 34 siswa yang terbagi menjadi kelas eksperimen (n=17) dan kelas kontrol (n=17). Data dikumpulkan melalui instrumen pretest-posttest yang tervalidasi dan angket *self-confidence*, kemudian dianalisis menggunakan *Independent Sample t-test* dan *Wilcoxon Signed Rank Test*. Hasil penelitian menunjukkan peningkatan hasil belajar yang signifikan pada kelas eksperimen (rata-rata = 78,29) dibandingkan kelas kontrol (rata-rata = 57,06), dengan Sig. = 0,001. Selain itu, *self-confidence* siswa meningkat secara signifikan dari kategori rendah (48,90%) menjadi tinggi (89,85%), dikonfirmasi dengan Sig. = 0,000. Observasi kelas juga mengungkapkan keterlibatan guru dan siswa yang sangat aktif. Temuan ini membuktikan bahwa media congklak merupakan alat pembelajaran yang efektif, relevan secara budaya, dan interaktif yang mampu meningkatkan capaian kognitif sekaligus perkembangan afektif dalam pendidikan matematika sekolah dasar.

Kata kunci: Hasil Belajar; KPK dan FPB; Media Congklak; Sekolah Dasar; Self-Confidence

INTRODUCTION

Mathematics learning in elementary school, particularly on abstract topics such as the Least Common Multiple (LCM) and Greatest Common Factor (GCF), often presents significant challenges (Lee et al., 2025). Students frequently struggle to understand these abstract concepts, which negatively affect both their cognitive achievement and affective development, especially their self-confidence (Luo

et al., 2026). Preliminary observations at SD Negeri 71 Ambon showed that fourth-grade students had low learning outcomes and poor self-confidence in LCM and GCF material, characterized by passive participation, hesitation, and reluctance to express opinions (Shamir & Levin, 2026). This problem is mainly caused by the dominance of conventional teaching methods that rely on lectures and drill exercises without concrete media, which fail to accommodate the cognitive characteristics of elementary school students who are at the concrete operational stage (Sandberg et al., 2026). To address this problem, the integration of concrete and interactive learning media has become urgent. Learning media serves as an important intermediary for stimulating cognitive processes, maintaining concentration, and building meaningful learning experiences (Ferguson et al., 2025). Among various alternatives, traditional game-based media offers a unique advantage by combining concrete manipulation with cultural contextualization. Congklak, a traditional counting game, emerges as the chosen solution in this study (Huang & Zhu, 2025). This game transforms abstract mathematical concepts into concrete and interactive activities, allowing students to visualize the process of grouping and counting directly through physical manipulation (Li et al., 2026). This approach aligns with the theoretical frameworks of Piaget and Bruner, which emphasize that physical manipulation (the enactive stage) is essential for students to build concrete operational knowledge before moving to symbolic representation (Ebbes et al., 2024).

The urgency of utilizing congklak media is supported by recent empirical evidence. Research by Hsu & Hsu (2026) and Piñeiro-Dosil et al. (2026) demonstrated its effectiveness in improving basic counting skills, while recent research by Carpendale et al. (2025) and Dor-Haim (2025) confirmed its significant impact on mastery of LCM and GCF. However, an important gap exists in the current literature: previous research has largely focused on cognitive achievement while neglecting the simultaneous improvement of affective variables (Ghassemi & Dallaire, 2026). Self-confidence is an important affective factor that bridges intellectual potential with actual academic achievement; students with high self-confidence are more likely to take intellectual risks and engage actively in learning (Y. Wang et al., 2026). Therefore, a simultaneous evaluation of the effect of congklak media on learning outcomes and self-confidence is needed to produce a more comprehensive learning model (Amini et al., 2026).

More specifically, a synthesis of previous studies reveals that research on congklak media and similar traditional games (Hsu & Hsu, 2026; Piñeiro-Dosil et al., 2026; Carpendale et al., 2025; Dor-Haim, 2025) consistently demonstrates its cognitive effectiveness, yet tends to overlook the simultaneous measurement of affective variables and is rarely accompanied by a rigorous controlled quasi-experimental design. Meanwhile, research on elementary students' self-confidence (Ghassemi & Dallaire, 2026; Y. Wang et al., 2026; Amini et al., 2026) is generally examined within the context of digital or technology-based learning rather than through concrete, locally rooted media. This gap (research gap) confirms that no study has specifically evaluated the effect of congklak media on learning outcomes and self-confidence simultaneously within the same experimental design. Building on this gap, this study presents a novelty by integrating the measurement of two variables, cognitive and affective, within a nonequivalent control group quasi-experimental design supported by classroom observation data on teacher and student activities, thereby strengthening the validity of the findings and expanding the theoretical and practical contributions compared to previous studies, which tend to be partial.

Based on the problems and research gap that have been identified, this study aims to determine the effect of using congklak media on mathematics learning outcomes and self-confidence among fourth-grade students on LCM and GCF material at SD Negeri 71 Ambon. The expected outcome of this study is to provide strong empirical evidence that congklak media is not only an effective cognitive

tool but also a powerful catalyst for affective development. Ultimately, this study intends to offer an innovative, contextual, and culturally relevant alternative for elementary mathematics learning that simultaneously optimizes students' academic achievement and psychological well-being.

METHOD

To affirm this study's position within the existing body of literature, the research gap underlying the design of this study is explicitly stated as follows: to date, no study has evaluated the effect of congklak media on students' learning outcomes and self-confidence simultaneously within the same experimental design. A synthesis of the literature review shows that previous studies on congklak media and similar traditional games (Hsu & Hsu, 2026; Piñeiro-Dosil et al., 2026; Carpendale et al., 2025; Dor-Haim, 2025) consistently demonstrate its cognitive effectiveness but tend to overlook the simultaneous measurement of affective variables and are rarely accompanied by a rigorous controlled quasi-experimental design, while research on elementary students' self-confidence (Ghassemi & Dallaire, 2026; Y. Wang et al., 2026; Amini et al., 2026) is generally examined in the context of digital or technology-based learning rather than through concrete, locally rooted media. Building on this synthesis, the novelty of this study lies in the integration of measuring two variables, cognitive and affective, within a nonequivalent control group quasi-experimental design supported by observation data on teacher and student activities, so that the methodological design described in the following section is directly aimed at addressing this gap and extending the contribution of previous studies, which tend to be partial.

This study used a quantitative approach with a quasi-experimental design, specifically a nonequivalent control group design, because full randomization was not possible due to the class structure predetermined by the school. The study was conducted at SD Negeri 71 Ambon, Ambon City, Maluku Province, during the even semester of the 2025/2026 academic year, from March to April 2026. The study population included all fourth-grade students enrolled in the 2025/2026 academic year. A purposive sampling technique was used to select the sample based on certain considerations, including equivalence in initial ability confirmed through pretest scores and teacher recommendations. Accordingly, two intact classes were selected: Class IV-A, consisting of 17 students, as the experimental group receiving the congklak media intervention, while Class IV-B, also consisting of 17 students, served as the control group receiving conventional instruction, resulting in a total sample of 34 students.

The research procedure was carried out through three systematic stages: preparation, implementation, and analysis. In the preparation stage, the researcher conducted preliminary observations and interviews to analyze learning needs, developed lesson plans for both the experimental and control groups, and prepared congklak media adapted to the LCM and GCF concepts. The implementation stage began with administering the pretest and self-confidence questionnaire to both groups to obtain baseline data. Subsequently, the experimental group participated in two learning sessions using congklak media, in which students actively manipulated physical components to solve mathematical problems, while the control group followed conventional lecture and drill methods. After the treatment was given, the posttest and self-confidence questionnaire were administered again to both groups. Simultaneously, observation sheets were used to monitor teacher and student activities during the experimental sessions. The final stage involved comprehensive data processing and statistical analysis.

Data were collected using three main instruments: a learning outcome test consisting of multiple-choice and essay questions, a self-confidence questionnaire using a four-point Likert scale, and an observation sheet. These instruments underwent rigorous content validity testing through expert judgment by two mathematics education lecturers, followed by empirical validity testing using Pearson Product-Moment correlation. Reliability was determined using the Kuder-Richardson formula (KR-20)

for the test and Cronbach's Alpha for the questionnaire, with both coefficients above 0.70. To interpret the data in accordance with the research objectives, quantitative data analysis was conducted using SPSS version 25. Descriptive statistics were used to summarize the data, while prerequisite tests, including the Shapiro-Wilk normality test and Levene's homogeneity test, were conducted prior to hypothesis testing. Hypothesis testing was then carried out using the Independent Sample t-test to evaluate the effect on learning outcomes and the Wilcoxon Signed Rank Test to assess the increase in self-confidence, given that the self-confidence data were not normally distributed. The significance level was set at 0.05 to determine the statistical acceptance or rejection of the hypotheses, ensuring that the research findings strongly answered the formulated research questions.

To strengthen methodological transparency, the instrument validation process was carried out in stages. Content validity was assessed by two mathematics education experts using an expert judgment assessment sheet based on the suitability of indicators, sentence construction, and material alignment with LCM and GCF, while empirical validity was calculated using Pearson Product-Moment correlation, with items considered valid if the calculated r value exceeded the table r value at a significance level of 0.05. The reliability of the learning outcome test was obtained using the Kuder-Richardson formula (KR-20) at 0.78, while the reliability of the self-confidence questionnaire was measured using Cronbach's Alpha at 0.82, both falling into the high reliability category. The selection of the sample using a purposive sampling technique was based on the consideration that the two selected classes (IV-A and IV-B) had homogeneous population characteristics, were taught by teachers with equivalent qualifications, and showed equivalence in initial ability confirmed through pretest results and classroom teacher recommendations, thereby minimizing potential selection bias even though full randomization could not be conducted. From an ethical standpoint, all data collection procedures obtained approval from the school and homeroom teachers and were preceded by informed consent from students' parents/guardians regarding the purpose, procedures, and confidentiality of the research data. Student identities were kept confidential through data anonymization, and all participation was voluntary without any negative impact on the students' academic assessment.

RESULT AND DISCUSSION

The research results are presented descriptively and supported by statistical tables. The data include learning outcomes, self-confidence levels, classroom activity observations, and hypothesis testing results.

Learning Outcome Data

Learning outcome data were collected through a pretest conducted on 10 March 2026 and a posttest on 7 April 2026. Descriptive statistics for both groups are presented in Table 1.

Table 1. Descriptive Statistics of Learning Outcomes for the Experimental and Control Classes

Class	Test	N	Mean	Std. Deviation	Minimum	Maximum
Experimental	Pretest	17	13.18	20.424	0	63
Experimental	Posttest	17	78.29	13.788	44	100
Control	Pretest	17	13.29	17.874	0	63
Control	Posttest	17	57.06	18.979	28	89

Source: Primary Research Data, 2026

Table 1 shows that the pretest means of both classes were nearly equal (Experimental = 13.18; Control = 13.29), indicating equivalence in initial ability before the treatment was given. After the treatment, the posttest mean of the experimental class increased sharply to 78.29, far exceeding the control class, which only reached 57.06. The posttest mean difference of 21.23 points demonstrates a

clear effect of congklak media on learning achievement. In the experimental class, the highest score achieved was 100 with a lowest score of 44, while in the control class the highest score was only 89 and the lowest score was 28.

Self-Confidence Data

Students' self-confidence was measured using a questionnaire administered before (pretest) and after (posttest) the treatment. The data were classified based on a categorization adapted from Arikunto (2010), as presented in Tables 2 and 3.

Table 2. Self-Confidence Categorization

No.	Score Interval	Percentage (%)	Category
1	65 – 80	81.25% – 100%	High
2	50 – 64	62.50% – 80%	Moderate
3	35 – 49	43.75% – 61.25%	Low
4	20 – 34	25.00% – 42.50%	Very Low

Source: Adapted from Arikunto (2010)

Table 3. Description of Self-Confidence Data and Category Percentages

Class	Measurement	N	Mean	Std. Deviation	Percentage	Category
Experimental	Pretest	17	39.12	4.442	48.90%	Low
Experimental	Posttest	17	71.88	3.389	89.85%	High
Control	Pretest	17	42.53	9.261	53.16%	Moderate
Control	Posttest	17	59.47	12.689	74.34%	Moderate

Source: Primary Research Data, 2026

Table 3 shows a remarkable increase in the experimental class. Before the treatment, the average self-confidence of experimental class students was only 39.12 (low category, 48.90%), but after using congklak media it increased significantly to 71.88 (high category, 89.85%). In contrast, the control class only experienced a moderate increase, remaining in the moderate category from 53.16% to 74.34%, despite an increase in absolute score.

Teacher and Student Activity Observation Data

Observations of student and teacher activity were conducted over two learning sessions in the experimental class. The results are presented in Tables 4 and 5.

Table 4. Results of Student Activity Observation in the Experimental Class

Session	Day/Date	Score	Percentage	Category
1	Monday, 13 April 2026	38	95.00%	Very Good
2	Tuesday, 14 April 2026	37	92.50%	Very Good
Mean	-	37.5	93.75%	Very Good

Source: Researcher Observation Data, 2026

Table 5. Results of Teacher Activity Observation in the Experimental Class

Session	Day/Date	Score	Percentage	Category
1	Monday, 13 April 2026	35	87.50%	Very Good
2	Tuesday, 14 April 2026	37	92.50%	Very Good
Mean	-	36	90.00%	Very Good

Source: Researcher Observation Data, 2026

The observation data in Tables 4 and 5 show that all sessions fell into the very good category (>81%), for both student activity (93.75%) and teacher activity (90.00%). This indicates that learning with congklak media was implemented effectively and was well planned.

Analysis Prerequisite Tests

Normality Test

Table 6. Normality Test Results for Learning Outcome Data (Shapiro-Wilk)

Data	Statistic	df	Sig.	Description
Pretest Experimental Class	0.619	17	0.000	Not Normal
Posttest Experimental Class	0.963	17	0.514	Normal
Pretest Control Class	0.786	17	0.001	Not Normal
Posttest Control Class	0.921	17	0.080	Normal

Table 6 shows that the pretest data of both classes were not normally distributed (Sig. < 0.05). However, the pretest data were not used as the basis for hypothesis testing, but only to check the equivalence of initial ability. The posttest data of both classes were normally distributed (Sig. > 0.05), thereby meeting the requirements for parametric testing.

Homogeneity Test

Table 7. Homogeneity Test Results for Posttest Data (Levene's Test)

Data	Levene's Statistic	df1	df2	Sig.	Description
Posttest Experimental & Control	3.301	1	32	0.079	Homogeneous

The Levene's test significance value of $0.079 > 0.05$ indicates that the variance of the posttest data of the experimental and control classes is homogeneous, thereby fulfilling the assumption of variance homogeneity.

Learning Outcome Hypothesis Testing (Independent Sample t-test)

Table 8. Independent Sample t-test Results for Posttest Learning Outcome Data

Class	N	Mean	Std. Deviation	t-value	Sig. (2-tailed)	Description
Experimental	17	78.29	13.788	3.635	0.001	H_0 Rejected / H_a Accepted
Control	17	57.06	18.979	-	-	-

Based on Table 8, the significance value (Sig. 2-tailed) of 0.001 is smaller than the significance level of 0.05. Thus, H_0 is rejected, and H_a is accepted, meaning there is a significant effect of using congklak media on students' learning outcomes. The posttest mean difference of 21.23 points shows the superiority of the experimental class over the control class.

Self-Confidence Hypothesis Testing (Wilcoxon Signed Rank Test)

Table 9. Normality Test Results for Self-Confidence Data (Shapiro-Wilk)

Data	Sig. Shapiro-Wilk	Description
Pretest Experimental	0.000	Not Normal
Posttest Experimental	0.027	Not Normal
Pretest Control	0.038	Not Normal
Posttest Control	0.003	Not Normal

Because all self-confidence data were not normally distributed (Sig. < 0.05), hypothesis testing was continued using the non-parametric Wilcoxon Signed-Rank Test.

Table 10. Wilcoxon Signed Rank Test Results for Self-Confidence

Class	Positive Ranks	Negative Ranks	Ties	Z	Asymp. Sig. (2-tailed)	Description
Experimental	17	0	0	-3.625	0.000	Significant
Control	17	0	0	-3.482	0.000	Significant

Table 10 shows that in the experimental class, the Asymp. Sig. (2-tailed) value = $0.000 < 0.05$,

with all students ($n=17$) experiencing an increase in self-confidence scores (positive ranks = 17, with no negative ranks or ties). This means there was a significant increase in self-confidence after learning using congklak media. Although the control class also showed a statistically significant increase ($\text{Sig.} = 0.000$), the magnitude of the increase in the control class was much smaller than in the experimental class, as reflected in the category change: the experimental class increased from low to high, while the control class remained in the moderate category.

The main objective of this study was to determine the effect of using congklak media on mathematics learning outcomes and students' self-confidence. Analysis of the posttest data shows a significant and substantial effect on learning outcomes, with the experimental class achieving a mean score of 78.29, far exceeding the control class, which only achieved a mean of 57.06 ($\text{Sig.} = 0.001 < 0.05$). This difference of 21.23 points clearly demonstrates the superiority of the congklak media intervention. The underlying reason for this significant cognitive improvement can be explained through Piaget's theory of cognitive development and Bruner's learning theory. Fourth-grade students, who are generally aged 9 to 10 years, are at the concrete operational stage, meaning they require physical and tangible objects to understand abstract concepts. The abstract nature of the Least Common Multiple (LCM) and Greatest Common Factor (GCF) often causes excessive cognitive load when taught conventionally. Congklak media bridges this gap by providing an enactive representation that allows students to physically manipulate seeds and holes on the board to visualize the processes of grouping, counting, and factoring (Pangestuti et al., 2026; Rencken et al., 2025; Retno et al., 2025). This direct manipulation transforms abstract mathematical rules into observable concrete actions, thereby facilitating deeper conceptual understanding (Aygün et al., 2026; Marini et al., 2025; Rahman et al., 2026). These findings reinforce and extend previous research by Arslan et al. (2025), Giuliani et al. (2026), and C. Wang & Huang (2025), which demonstrated that the effectiveness of congklak is not limited to basic counting (Zhang & An, 2026) but is also highly effective for more advanced abstraction topics such as LCM and GCF in the upper elementary grades.

In addition to cognitive benefits, this study also successfully addressed the affective dimension of learning, particularly self-confidence (Alkhatib et al., 2026; Pelletier et al., 2025; Wade et al., 2026). The data show a remarkable change in the experimental class, where the mean self-confidence score increased from 39.12 (low category, 48.90%) to 71.88 (high category, 89.85%), with a highly significant Wilcoxon test result ($\text{Sig.} = 0.000$). Specifically, all 17 students in the experimental group experienced a positive increase, while the control class only showed a marginal increase and remained in the moderate category. The mechanism driving this affective change lies in the psychological environment created by congklak media. Unlike conventional drill-and-practice methods, which often trigger mathematics anxiety, congklak creates a play-based, collaborative, and non-threatening atmosphere (Allan et al., 2026; Ndruru et al., 2025; Yang & Lu, 2024). According to Bandura's self-efficacy theory (1997), mastery experience is the strongest source of self-confidence. When students successfully manipulated the congklak board to solve LCM and GCF problems, they accumulated direct and tangible experiences of success. These repeated small successes, reinforced by peer discussion and teacher facilitation, systematically broke down their initial hesitation and built strong self-confidence (Guo et al., 2025; Pinar & Ocak, 2026; Yuan et al., 2025). These findings align with Annetta et al. (2024), Irmansyah et al. (2026), and Su-Keene et al. (2026), who confirm that traditional game-based media inherently possess the social and interactive stimuli needed to foster students' psychological well-being and self-confidence in academic settings.

The synergy between classroom activity, self-confidence, and learning outcomes further strengthens the context of these findings. Observation data show that both student activity (93.75%) and teacher activity (90.00%) during the congklak intervention fell into the "very good" category. This high

level of engagement is not merely a byproduct of a new learning tool but a fundamental catalyst linking affective and cognitive improvement. As stated by Heinz et al. (2026), Kevin et al. (2025), and Thianwan & Srikoorn (2026), self-confidence serves as an important mediator between learning engagement and academic achievement. Congklak media actively requires student participation; students cannot remain passive observers. This enforced active participation (the enactive stage) encourages students to take intellectual risks, such as proposing strategies or verifying answers with peers (Bütüner et al., 2025; Grosch et al., 2026; Kang et al., 2026). The high level of activity generated fosters a sense of ownership over the learning process, which in turn enhances self-confidence. As a result, this increased psychological readiness and active cognitive engagement translated directly into higher posttest scores in the experimental class. Therefore, congklak functions not only as a visual aid but also as a comprehensive pedagogical catalyst that activates a positive feedback cycle: active engagement → increased self-confidence → improved learning outcomes (da Silva et al., 2025; N. Wang et al., 2026; Wu et al., 2026). Ultimately, these findings directly address the initial problem identified at SD Negeri 71 Ambon, where conventional teaching methods resulted in low learning outcomes and poor self-confidence. This study proves that integrating local wisdom, such as the traditional congklak game, into the mathematics curriculum is a highly effective and contextual solution. This indicates that addressing cognitive deficits in abstract mathematics requires simultaneous attention to the affective domain. By providing a culturally relevant, concrete, and interactive learning experience, congklak media successfully transformed the classroom from a passive, anxiety-inducing environment into an active, confidence-building space, thereby optimizing both the academic achievement and psychological development of elementary school students.

Theoretically, these findings reinforce the conceptual framework of Piaget and Bruner regarding the importance of enactive representation in elementary mathematics learning, while also extending Bandura's self-efficacy theory (1997) by showing that mastery experience through the manipulation of concrete, culturally based media can serve as a mechanism bridging simultaneous cognitive and affective improvement, a relationship that has not been widely elaborated explicitly in previous literature, which tends to examine both aspects separately (Ghassemi & Dallaire, 2026; Hsu & Hsu, 2026). Compared with the studies of Arslan et al. (2025) and Giuliani et al. (2026), which highlight socio-emotional engagement in learning but do not involve concrete manipulative media, this study shows that integrating local culture into learning aids produces a more measurable and specific impact on mastery of abstract mathematical concepts. Practically, these findings indicate that elementary school teachers can adopt traditional game-based media as an alternative learning strategy that is relatively inexpensive, easy to replicate, and does not require technological infrastructure, making it suitable for implementation in schools with limited resources. A further implication for curriculum developers is the need to systematically consider the integration of local wisdom into mathematics learning design, not merely as a variation in teaching methods, but as an intervention strategy that has been empirically proven to support both cognitive achievement and students' psychological well-being.

CONCLUSION

This study concludes that the use of congklak media significantly improves mathematics learning outcomes and self-confidence among fourth-grade students in mastering the concepts of the Least Common Multiple (LCM) and Greatest Common Factor (GCF). Empirical evidence shows that the experimental group achieved a much higher posttest score than the control group, accompanied by a remarkable increase in students' self-confidence from the low to the high category, confirming that game-based concrete manipulation effectively bridges the understanding of abstract mathematics and affective development. Therefore, it is strongly recommended that elementary school educators integrate

congklak and similar culturally rooted traditional games into mathematics learning to create an active, enjoyable, and psychologically supportive learning environment, while future researchers are advised to use larger, randomized samples and longitudinal designs to further validate and extend these pedagogical benefits.

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